# Syllabus for Psychology 502 "Advanced Psychological Statistics I"
# Fall 2014, Rice University

**Administrative Info**

*Class sessions*
Tuesday and Thursday
1:00–2:20 p.m.
Sewall 133

*Instructor*
Professor Mike Byrne
484 Sewall, x3770
psyc502@rice.edu
Office hours: Tuesdays and Thursdays, 2:30–3:30 p.m.

*Teaching Assistant*
Clayton Stanley
211A Sewall Hall, x3411
clayton.stanley@rice.edu
Office hour: Tuesday, 10:00–11:00 a.m.

**Required Texts**

Howell, D. C. (2013). *Statistical methods for psychology*, 8th edition. Belmont, CA: Duxbury Press/Wasdworth Publishing. ISBN 978-1111835484. (Also available as a Kindle book.)

Abelson, R. P. (1995). *Statistics as principled argument*. Hillsdale, NJ: Lawrence Erlbaum. ISBN 978-0805805284. (Also available as a Kindle book and an iBook.)

Publication Manual of the American Psychological Association, 6th edition. (2010). ISBN 978-1433805615. (Also available as a Kindle book.)

Other readings as assigned. You'll need the Howell text right away, but the Abelson text you won't need until the latter half of the semester. The APA manual you should get soon, but it's not vital for the first few weeks.

**Course Objectives/Goals**

Science in psychology is primarily empirical. Thus, one requirement for becoming a researcher in psychology is the ability to understand data. Inferential statistics is the language for describing and interpreting data in psychology. This course is designed to introduce students to the underlying language of inferential statistics and how they work. There are two primary pedagogical objectives:

• Conceptual understanding. You should get a conceptual understanding for why psychologists use statistics and the underlying meaning of the statistical techniques most commonly used. I want you to become an educated consumer of the statistics you will encounter in the literature, even those you will never use yourself.

• Practical experience. Besides understanding the fundamental concepts underlying statistics, you will need to know how to perform exploratory data analysis and a range of statistical tests. Statistical analysis is now done almost exclusively on computers, and thus you will be asked to use a standard commercial statistics package (e.g., SPSS) for most of the coursework.

Psychologists rarely derive equations for their statistical tests anymore. While the equations underlying many statistical concepts will be described, this course is not intended to be a mathematics course and we will not be showing derivations or proofs.

**Teaching Philosophy**

I believe hands-on experience doing statistics is the only way for you to acquire the analysis skills you will need. Because of that, most statistics courses include a laboratory; this one does not. In order to compensate for the lack of lab, I will be assigning a great deal of homework--you should expect homework to be assigned most class sessions, to be handed in the following class session. These assignments are designed to give you the hands-on experience you will need.

Attendance at lectures is not mandatory, but is strongly encouraged. The primary text used for this course is unusually clear and readable for a statistics textbook, though not perhaps as complete as I would like. Thus, I intended to use the limited class time to present additional material not covered in the text, answer questions raised by the text, and general discussion. Unless your background in statistics is very strong, neither lecture or text alone will cover all the material.

Based on my prior experience teaching statistics, it is my expectation that some of you will struggle with some of the material. You should not be embarrassed by this, but you should definitely ask me or the TA for help! While the class is not intended to be easy, it should also not be impossible. The TA and I are here to assist you with this material however we can.

Furthermore, cognitive psychology has demonstrated that we learn best when we are learning at the edge of what we already know. Thus, it is imperative that you keep up with the course, because unlike most courses in psychology, pretty much every topic in statistics requires knowledge of the previous topic—it is nearly impossible to "catch up" if you get a week behind. Thus, I reserve the right to change the syllabus or institute pop quizzes as external motivation if I think people are falling behind.

Finally, one other thing we've learned from cognitive psychology is that it's very difficult for people to effectively do more than one thing at a time. Thus, I will provide you with copies of the class notes so that you aren't under so much pressure to write everything down during class sessions. Please print out the notes prior to class and bring the printed notes—any notes you take should go right on those printouts.

**Exams, Homework, and Grading**
Frankly, because the subject material is so fundamental to scientific work within psychology, I feel the course should be graded entirely pass/fail—either you understand the material well enough to do analyses on your own or you don't. However, a more finely-discriminated grading scale is generally expected.

There will be regular homework and two exams: a midterm and a final. Both exams will be take-home exams that will require data analysis with a statistical packages as well as written work (yes, including essays). Due dates for homework assignments are listed on the schedule but may change a little.

The notion of class participation may seem odd in a statistics course, but is relevant, especially when we get into discussions of how and when to use what you've learned. It is also valuable to stop me in lecture when I'm going too fast or being unclear. Thus, there is a participation aspect of the course.

The breakdown will be as follows:

25% Midterm
35% Final Exam
30% Homework
10% Participation

The class will be curved, with the minimum guarantee that if you get 90% of the points, you will receive an "A," 80% for a "B," etc. I expect few of you will get 90%, however, as I am a picky grader.

There is one final grading requirement: passing the course requires passing the final exam. That is, if your grade on the final exam is a C+ or less, your semester grade will be, at best, a C+. Similarly a C on the final exam caps your semester grade at a C, which is a failing grade in graduate school.

*Homework policy*
Homework is due at the time and date noted on OWL-Space. Homework that is handed in up to 24 hours late will be penalized 20%. Each additional 24 hours will incur another 20% penalty (e.g. 3 days late would be 60% off). There are two caveats:

* If a homework problem is discussed in class, no credit for that problem will be earned if the homework is handed in after that discussion.
* Once solutions are posted, the penalty becomes 100%, i.e., you get a zero.

Lastly, your single worst homework assignment grade will be dropped. That is, exactly one time during the semester you may punt a homework assignment without excuse. However, this means I will not take any excuses for significantly late/missing homework assignments other than that one. This includes weddings, conferences, etc.; this is why you get one free one. Serious illness is another matter, but you need to notify me as soon as possible. There is one exception to this rule, however: you may *not* drop the last homework assignment of the semester. This homework covers concepts that are critical for the final exam and you need to complete this homework.

**Statistics Software**
The course will be taught based on the SPSS software package; however, since R is now fairly common in psychology example code and homework solutions will be provided in R as well. It is important to note that the two packages (SPSS and R) have different strengths and weaknesses, and some things that are easy in SPSS are difficult in R and vice versa. Please discuss with your advisor what is better for your lab.

Note that SPSS allows you to do analyses entirely via the GUI (graphical user interface). This has plusses and minuses—you must also learn the command language, which SPSS calls "syntax." It is extremely tiresome to do difficult analyses without using the syntax, and you are required to hand it in anyway, so get used to using it.

In addition, you will be required to produce graphs of your data. I do not plan to teach you a graphing package such as Excel, DeltaGraph, or Igor. However, you are strongly encouraged to learn one of these packages as SPSS is not particularly good at producing high-quality graphs (though SPSS gets a little better with each release). R is somewhat better for graphs.

**Honor Code**
In practice, it will always be possible for you to ask for help with statistics. Thus, it is acceptable for you to work together on the homework assignments. However, because each one of you does need to acquire the concepts and skills being taught, the exams will be covered by the Honor Code. Many new graduate students are unfamiliar with Rice's Honor Code. If this applies to you, please go to http://honor.rice.edu/ and do some reading. Learning the terms of Rice's Honor Code is your responsibility.

Despite the fact that I think talking to people about extenuating circumstances and giving people a chance to explain themselves before bringing to bear any kind of accusation, previous experience dictates that such openness is, in fact, not a practical policy. Thus, I will not attempt to investigate cheating on my own or talk to you about possible alternative explanations; anything suspicious will simply be turned over to the Honor Council. Please do not force me to take these measures.

**Learning Disabilities**
Any student with a documented disability needing academic adjustments or accommodations is requested to speak with me during the first two weeks of class. All discussions will remain confidential. Students with disabilities should also contact Disability Support Services in the Allen Center.

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*2014.08.25*

# Schedule for Psychology 502 "Advanced Psychological Statistics I"
# Fall 2014, Rice University

**August 26**
Introduction

**August 28**
Descriptive statistics and introduction to SPSS
Reading due: Howell chapters 1 and 2

**September 2**
Probability theory 1
Reading due: Howell chapter 5
*Homework #1 due*

**September 4**
Probability theory 2

*Homework #2 due Sept. 8*

**September 9**
Normal distribution and hypothesis testing
Reading due: Howell chapter 3, start Howell chapter 4

**September 11**
Sampling distributions and hypothesis Testing
Reading due: Howell chapter 4, first half of chapter 7

*Homework #3 due Sept. 14*

**September 16**
Power 1
Reading due: Howell chapter 8

**September 18**
Power 2
Reading due: Howell chapter 8 (read it again, really)

*Homework #4 due Sept. 20*

**September 23**
Hypothesis Testing of Means (a.k.a. the *t*-ratio)
Reading due: rest of Howell chapter 7

*r2*
*2014.09.22*

**September 25**
Correlation and regression
Reading due: Howell chapter 9

*Homework #5 due Sept. 26*

**September 30**
Hypothesis Testing 2

**October 2**
Miscellany
*Homework #6 due*
*Midterm handed out*

**October 7**
Simple ANOVA 1
Reading due: Howell 11.1-11.7

**October 9 & 14**
No class—instructor out of town Oct 9 and fall recess Oct 14. Work on the midterm!

**October 16**
Simple ANOVA 2
Reading due: Howell 11.8-11.13
*Midterm due*

**October 21**
Multiple Comparisons 1
Reading due: Howell 12.1-12.5

**October 23**
Multiple Comparisons 2/Midterm handed back
Reading due: Howell 12.6-12.10
*Homework #7 due*

**October 28**
No class—instructor out of town for a conference

**October 30**
Factorial ANOVA 1
Reading due: Howell chapter 13
*Homework #8 due*

**November 4**
Factorial ANOVA 2

**November 6**
Factorial ANOVA 3 (maybe)/Repeated Measures ANOVA 1
Reading due: Howell 14.1-14.6
*Homework #9 due*

**November 11**
Repeated Measures ANOVA 2
Reading due: Howell 14.7-14.12

**November 13**
Repeated Measures ANOVA 3
*Homework #10 due*

**November 18**
Repeated Measures ANOVA 4

**November 20**
Categorical Association
Reading due: Howell chapter 6
*Homework #11 due*

**November 25**
Issues 1
Reading due: Abelson chapters 1–5

**November 27**
No class for Thanksgiving

**December 2**
Issues 2
Reading due: Ableson chapters 6–9

*December 3rd: Homework #12 due, Final Exam handed out online*

**December 4**
Issues 3; Q&A on the final
Readings due: TBA, but probably Cohen (1994); Abelson (1997); Nickerson (2000)

**December 17**
Final exam due by 5:00 p.m.

*Disclaimer*

While I will attempt to stick as closely as possible to the schedule outlined above, it may be necessary to adjust the schedule to accommodate the material. I reserve the right to change this without notice, though of course I'll try to give notice.